

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 Claim 1 (original): For use in a system including a light  
2 source, and a light detector, for measuring one or more of  
3 at least two target substances, each of the at least two  
4 target substances including a chain of nucleotides, a  
5 sensor comprising:

6 a) at least one optical carrier;  
7 b) at least two optical cavities, each of the at  
8 least two optical cavities

9 1) being optically coupled with the optical  
10 carrier, and  
11 2) having a surface including oligonucleotides  
12 complementary to a particular one of the at least  
13 two target substances,

14 wherein, when light is applied to the optical  
15 carrier, a resonance within each of the optical cavities is  
16 excited,

17 wherein, if a target substance hybridizes with  
18 oligonucleotides on the surface of an optical cavity, a  
19 shift in the resonance of that optical cavity occurs, and  
20 wherein a measurement of the target substance can  
21 be determined based on the shift in resonance.

1 Claim 2 (original): The sensor of claim 1 wherein the  
2 optical carrier is an optical fiber.

1 Claim 3 (original): The sensor of claim 1 wherein at least  
2 one of the optical cavities is a microsphere.

1 Claim 4 (original): The sensor of claim 1 wherein at least

2 one of the optical cavities is a toroidal microcavity.

1 Claim 5 (original): The sensor of claim 1 wherein at least  
2 one of the optical cavities is a InP microdisk.

1 Claim 6 (currently amended): The sensor of claim 1 wherein  
2 at least one of the target substances is DNA.

1 Claim 7 (currently amended): The sensor of claim 1 wherein  
2 at least one of the target substances is RNA.

1 Claim 8 (original): The sensor of claim 1 wherein, if a  
2 target substance hybridizes with oligonucleotides on the  
3 surface of an optical cavity surface, a shift in the  
4 resonance of that optical cavity of a first amount occurs,  
5 and

6 wherein if a substance which differs from the target  
7 substance by a single nucleotide is made available for  
8 hybridization with the surface of the optical cavity  
9 surface, a shift in the resonance of the optical cavity of  
10 a second amount occurs, wherein the first amount is  
11 detectably greater than the second amount.

1 Claim 9 (original): The sensor of claim 8 wherein the  
2 first amount is at least ten times greater than the second  
3 amount.

1 Claim 10 (original): The sensor of claim 1 wherein the  
2 oligonucleotides provided on at least one of the optical  
3 cavities are 11-mer oligonucleotides.

1 Claim 11 (original): The sensor of claim 1 wherein the

2 oligonucleotides provided on at least one of the optical  
3 cavities are at least 27-mer oligonucleotides.

1 Claim 12 (original): The sensor of claim 1 wherein the  
2 oligonucleotides provided on at least one of the optical  
3 cavities are at least 11-mer oligonucleotides.

1 Claim 13 (original): The sensor of claim 1 wherein the  
2 oligonucleotides provided on at least one of the optical  
3 cavities are at most 27-mer oligonucleotides.

1 Claim 14 (original): A system for measuring one or more of  
2 at least two target substances, each of the at least two  
3 target substances including a chain of nucleotides, the  
4 system comprising:

- 5 a) a light source;
- 6 b) a light detector;
- 7 c) a sensor, the sensor including:
  - 8 1) at least one optical carrier optically  
9 coupled with both the light source and the light  
10 detector;
  - 11 2) at least two optical cavities, each of the at  
12 least two optical cavities
    - 13 A) being optically coupled with the optical  
14 carrier, and
    - 15 B) having a surface including  
16 oligonucleotides complementary to a  
17 particular one of the at least two target  
18 substances,  
19 wherein, when the light source applies  
20 light to the optical carrier, a resonance within  
21 each of the optical cavities, having a first

22 characteristic, is excited and is detected by the  
23 detector, and

24 wherein, if a target substance  
25 hybridizes with oligonucleotides on the surface  
26 of an optical cavity, a change in the  
27 characteristic of the resonance of that optical  
28 cavity occurs and is detected by the detector;  
29 and

30 d) a processor for determining a measurement of the  
31 target substance using a shift in the characteristic  
32 of the resonances detected by the detector.

1 Claim 15 (original): The system of claim 14 wherein the  
2 optical carrier is an optical fiber.

1 Claim 16 (original): The system of claim 14 wherein at  
2 least one of the optical cavities is a microsphere.

1 Claim 17 (original): The system of claim 14 wherein at  
2 least one of the optical cavities is a toroidal  
3 microcavity.

1 Claim 18 (original): The system of claim 14 wherein at  
2 least one of the optical cavities is a InP microdisk.

1 Claim 19 (currently amended): The system of claim 14  
2 wherein at least one of the target substances is DNA.

1 Claim 20 (currently amended): The system of claim 14  
2 wherein at least one of the target substances is RNA.

1 Claim 21 (original): The system of claim 14 wherein, if a

2 target substance hybridizes with oligonucleotides on the  
3 surface of an optical cavity surface, a shift in the  
4 resonance of that optical cavity of a first amount occurs,  
5 and

6 wherein if a substance which differs from the target  
7 substance by a single nucleotide is made available for  
8 hybridization with the surface of the optical cavity  
9 surface, a shift in the resonance of the optical cavity of  
10 a second amount occurs, wherein the first amount is  
11 detectably greater than the second amount.

1 Claim 22 (original): The system of claim 21 wherein the  
2 first amount is at least ten times greater than the second  
3 amount.

1 Claim 23 (original): The system of claim 14 wherein the  
2 oligonucleotides provided on at least one of the optical  
3 cavities are 11-mer oligonucleotides.

1 Claim 24 (original): The system of claim 14 wherein the  
2 oligonucleotides provided on at least one of the optical  
3 cavities are at least 27-mer oligonucleotides.

1 Claim 25 (original): The system of claim 14 wherein the  
2 oligonucleotides provided on at least one of the optical  
3 cavities are at least 11-mer oligonucleotides.

1 Claim 26 (original): The system of claim 14 wherein the  
2 oligonucleotides provided on at least one of the optical  
3 cavities are at most 27-mer oligonucleotides.

1 Claim 27 (original): The system of claim 14 wherein the

2 processor determines the measurement of the target  
3 substance using a shift in characteristic of the resonances  
4 detected by the detector, and refractive indices of the  
5 optical cavity and a solution in which the target substance  
6 is allowed to come into contact with the optical cavity.

1 Claim 28 (original): The system of claim 27 wherein the  
2 processor determines the measurement of the target  
3 substance further using an excess polarizability of a  
4 volume of the target over an equal volume of a solution in  
5 which the target is provided.

1 Claim 29 (original): The system of claim 14, wherein the  
2 optical cavity is a microsphere, and  
3 wherein the processor determines the measurement of  
4 the target substance using a shift in characteristic of the  
5 resonances detected by the detector, and a radius of the  
6 microsphere.

1 Claim 30 (original): The system of claim 14 wherein the  
2 measurement of the target substance is a surface density of  
3 the target substance bound to the optical cavity.

1 Claim 31 (original): The system of claim 14 wherein the at  
2 least one optical carrier includes a plurality of optical  
3 fibers.

1 Claim 32 (original): The system of claim 31 wherein each  
2 of the plurality of optical fibers is optically coupled  
3 with at least two of the optical cavities.

1 Claim 33 (original): The system of claim 31 further

2 comprising at least one additional light detector,  
3 wherein at least two of the plurality of optical fibers  
4 are optically coupled with a common light source, but with  
5 different light detectors.

Claims 34-39 (canceled)